



United States
Department of
Agriculture

Forest
Service

Southwestern
Region

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Reply to: 3420

Date: November 28, 1988

Subject: Western Spruce Budworm Biological Evaluation, 1988

To: Forest Supervisor, Apache-Sitgreaves National Forests

On September 22, Forest Pest Management (FPM) entomologist Dayle Bennett conducted an evaluation of defoliated mixed conifer stands on the Alpine Ranger District. These defoliated stands, totaling about 5,840 acres, were noted during the annual forest pest aerial detection survey conducted over the Apache-Sitgreaves National Forests (A-S NF's) on August 15 through 18, 1988 (see our letter dated September 6). At that time, we suspected the defoliation was caused by western spruce budworm (WSB) and scheduled a followup evaluation of the area. The purpose of this followup evaluation is to verify WSB as the cause of defoliation, to determine the intensity of current year's defoliation, to assess the WSB population through egg mass sampling in order to predict 1989 intensity levels and location of defoliation, and to determine potential for WSB outbreaks and subsequent damage through susceptibility factors and hazard ratings.

During this evaluation, Dayle made observations and collected data from eight sites (see enclosed map), four located south of Black River and four located in the vicinity of Middle Mountain. These observations and data, summarized in the enclosed table, verified WSB as the cause of defoliation. They also showed defoliation has occurred for the past two years in most of these areas, with current year's defoliation generally at moderate levels (35 to 65 percent defoliation of current year's foliage). Thus far, both overstory and understory damages are light. No top-killing, branch dieback, or mortality due to WSB was found.

Analysis of WSB egg mass data collected from these sites show egg mass densities ranged from 15.8 to 63.1 per meter square of foliage with a mean average of 32.3 (S.E. = 5.3). Based on past experience and barring any extreme climatic aberration, this relatively high density indicates defoliation can be expected to occur throughout these same areas again next year. The area of defoliation may expand into surrounding host type and defoliation levels will probably intensify, depending upon variation in WSB densities and individual stand conditions.

It is difficult to predict how long this outbreak might last and how much, if any, permanent damage might result. Similar areas of WSB-caused defoliation have occurred at nearby locations on the Alpine RD since 1984. Thus far, these "flare ups" have been short-lived (two to three years), and collapsed before permanent damages were sustained. We suspect this collapse may occur in these stands. However, as these stands continue to mature into dense, unevenaged climax stands of Douglas-fir and white fir, the frequency and duration of outbreaks will likely increase and result in more permanent damage.

As a generalized aid in determining outbreak potential and extent of subsequent damage from WSB, Dayle utilized the stand susceptibility rating system as






described in Chapter 50 of FSH 2409.26a, Cutting Methods Handbook. This system is based on stand characteristics, represented by one or more variables, that collectively index the quality of budworm habitat. These factors include: Species composition (percent host and percent climax host crown cover); density (total percent crown cover); height-class structure; vigor (relative stand density; maturity (basal-area-weighted mean host age); site climate (habitat type); regional climate; and surrounding host type. Classes are identified for each variable, and an index value is assigned to each class. The product of the index values for all variables results in a relative rating of stand susceptibility. For convenience, a rating of 0-20 is considered low; 21-50 is moderate; and 50-100 is high. Primary value of this system is to allow managers to map, locate and select areas for silvicultural treatments to reduce stand susceptibility.

Data related to stand conditions at these sites indicate ratings vary from low to high. The most variable factors affecting these ratings were species composition, density, height-class structure, and vigor. At most sample sites, species composition consisted primarily of Douglas-fir and white fir, with lesser amounts of ponderosa pine, southwestern white pine, oak, aspen, and occasionally, spruce. Densities varied, with most crown covers and relative stand densities exceeding 50 percent. Stand structures were generally multistoried to unevenaged, with some single and two-storied stands. The other susceptibility index factors, which included maturity, site climate, regional climate, and surrounding host type, were fairly constant throughout the evaluated area and of sufficiently high value to indicate increased susceptibility. Average stand ages exceeded 76 years, and percent host type in the surrounding 1,000 acres usually exceeded 75 percent. Habitat types were nearly all in the dry to mesic white fir or warm, dry white fir and Douglas-fir types.

Since the most efficient method of reducing stand hazard ratings, i.e., outbreak and damage potential, is by using silvicultural treatments to reduce factors over which we have some control, we recommend you continue your efforts to identify and silviculturally treat moderate to high hazard stands that occur in areas where WSB damages may adversely impact management objectives. We will continue to monitor and report on the status of WSB activity across the A-S NF's through aerial and ground surveys, and recommend you notify us of any new areas of defoliation detected by your field personnel.


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Director of Forest Pest Management

Enclosures (2)



WESTERN SPRUCE BUDWORM EGG MASS DENSITY AND STAND CONDITIONS
Apache-Sitgreaves National Forests, 1988

Site No.	Overstory Damage ^{1/}	Understory Damage ^{1/}	Current Year's Defoliation ^{2/}	Total Years Defoliated	Stand Structure	Species Composition ^{3/}	Habitat Type ^{4/}	Hazard Rating ^{5/}	Egg Mass Density M ²	Remarks
1	Light	Light	Medium	2	Single story	DF-50%, PP 50%	PSME/ QUGA	Low	63.4	
2	Light	Medium	Medium	2	Two-story	PP overstory DF understory	ABCO/ RONE	Low	25.0	
3	Light	Medium	Medium	2	Uneven-aged	Mixed DF, PP, WF, BS, Oak	PIPU/ CAFO	Mod	15.9	
4	Light	Light	Medium	2	Uneven-aged	Mixed WF, DF, PP, Oak	ABCO/ QUGA	High	24.0	Severe dwarf mistletoe infection
5	Light	Light	Medium	2	Uneven-aged	Mixed DF, WF, PP, A	ABCO/ RONE	Mod	20.6	
6	Light	Light	Medium	2	Uneven-aged	Mixed DF, WF, PP A	ABCO/ MUVI	Mod	35.1	Dwarf mistletoe in DF, PP, WP
7	Medium	Medium	Heavy	2	Multi-atory	Mixed DF, PP, A WF, WP	ABCO/ RONE	Low	40.4	
8	Light	Light	Light	2	Uneven-aged	Mixed DF, PP, WF WP	ABCO/ QUGA	Low	33.9	

^{1/} Overstory and understory damage codes: Light = < 50% cumulative defoliation, no apparent top-kill or mortality; medium = > 50% cumulative defoliation and some apparent top-kill and/or mortality.

^{2/} Current year's defoliation codes: Light = 5 to 25% defoliation; medium = 26 to 65% defoliation; and heavy = 66 to 100% defoliation.

^{3/} Species are listed in descending order of occurrence in stand. Codes are: DF = Douglas-fir, PP = Ponderosa pine, WF = white fir, BS = blue spruce, WP = southwestern pine, A = aspen, and oak = oak sp.

^{4/} Forest and woodland habitat types (plant associations) of southern New Mexico and central Arizona (north of the Mogollon Rim). USDA-FS, Southwestern Region. 77 p.

^{5/} Hazard ratings determined in accordance with procedures described in FSH 2409.26a, Cutting Methods Handbook.